

# Evaluation of Performance in Trauma Care: experts' viewpoints

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## Research article

**Keywords:** Performance indicators, Evaluation, Hospital, Trauma care

**Posted Date:** January 7th, 2020

**DOI:** <https://doi.org/10.21203/rs.2.20168/v1>

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# Abstract

**Background:** Trauma is one of the leading causes of mortality across the world. Trauma patients had critical status and need timely, adequate and organized care. The different consequences of trauma care among service centers around the world and even within a country reveal the need for care assessment. This study was designed and executed to collect experts' opinion on the evaluation of trauma care in Iran. **Methods:** This qualitative study with conventional content analysis approach, two focus group discussions with 12 participants and 16 face-to-face in-depth interviews were conducted to collect the required data. Participants were selected through purposive sampling method. The experts' viewpoints were classified in accordance with the main and sub themes. **Results:** Four basic themes extracted from the interviews and focus group discussion including, trauma care importance (sub-themes: the involved Individuals' being young and productive and the effectiveness of trauma care); trauma care indicators (sub-themes: pre-hospital indicators, in-hospital indicators and post-hospital indicators); stages of trauma care evaluation (sub-themes: evaluation prerequisites, finalization of indicators prior to evaluation, determining evaluation time scope, determining evaluation dimensions, monitoring and evaluation and use of evaluation results); trauma care promotion (sub-themes: balancing workload in trauma centers, enhancement of information system, considering extra-organizational dimensions in trauma care and empowerment of trauma care providers). **Conclusion:** Performance evaluation through acceptable indicators is basis of health care improvement. In addition to the evaluation, reforming macro policies, development of infrastructures, enhancement of information system and training care providers should be taken into account too. **Keywords:** Performance indicators, Evaluation, Hospital, Trauma care

## Background

World Health Organization defines injury or trauma as an intense strike of body with physical factors such as mechanical energy, heat, electricity, chemical substances, and ionization rays [1]. Trauma is an inevitable cause of death across the world [2]. Trauma injuries cause higher mortality rates compared to AIDS (Acquired immune deficiency syndrome), Malaria and tuberculosis [3]. The number of deaths caused by trauma is estimated to be 5.8 million per year [4]. The majority of dead people are below 45 years of age [5]. Trauma patients are patients with high financial burden [6]. Such injuries lead to 52 million DALY (Disability adjusted life years) and contribute to 15% of global burden of disease [7].

In developing countries, injury is a more serious challenge. These countries have the highest number of traumatic car accidents. On the other hand, they lack an organized trauma system [4]. Car accidents account for 1 to 15 percent of GDP (Gross domestic product) fall in developing countries [8]. According to estimations, the implementation of plans for improving care services to trauma patients will save 1.730 to 1.964 people annually [3]. In Iran, trauma is considered to be an important issue. It is the second cause of Iranian's death and first cause of death among youth. Further, it is the most important cause of DALY [9].

Trauma management needs quick and pre-determined and cost-effective performance for the injured people [10, 11]. Half of trauma patients do not receive adequate cares. Medical errors are common and preventable deaths are reported in hospitals [12]. There are some pieces of evidence indicating that clinical care level is below standard and trauma outcomes are different in trauma centers [5]. Moreover, health care authorities have declared that due to the remarkable increase in health care costs, it is necessary to collect data on health care performance [11]. According to evidence, paying attention to the data associated with the cause of different performances and taking necessary measures in this regard improves the quality and efficiency of care providing centers [11].

Health care services have low chance of improvement unless they are evaluated correctly [10]. For the first time, the trauma committee of American College of Physicians and Surgeons formulated some indicators for quality measurement of trauma care. Initially, these indicators contained 12 auditing filters. Later, the number of them increased and they were separated to general and special indicators [13]. Although using evaluation methods of developed countries may be beneficial, it seems necessary that they should be localized in accordance with the conditions and databases of developing countries [14].

In Iran, Ministry of Health and Medical Education have defined five criteria as the key performance indicators of hospital emergency services (not trauma services only) in order to measure and evaluate the performance of emergency centers. The indicators are percentage of patients' deposition within 6 hours and deposition within 12 hours, unsuccessful CPR (Cardio Pulmonary Resuscitation), discharge against medical advice and mean triage time [15]. Nevertheless, no pre-defined and specific indicator was found about trauma care in Iran. It is said that resorting to specialists' opinion provides some principles for trauma cares and prepares it to change [16]. Therefore, this study was designed and implemented to collect experts' opinion about performance evaluation in trauma care.

## **Materials & Methods**

This was a qualitative study with conventional content analysis approach. The study was part of a broader project titled "developing a hospital performance assessment model for patients management with traffic injures". Conventional content analysis approach is used to interpret implications derived from the content of text data [17]. This study was conducted from November 2017 to May 2018. The purpose of the study was to investigate how trauma care performance is evaluated. Focus group discussions and semi-structured in-depth interviews were used to collect the views of 28 trauma care experts.

## **Focus group discussion**

Two focus group discussions, each of which lasted for 60 to 90 minutes, were held with 12 participants. The participants were selected through purposive sampling method [18]. They were physicians, who were involved in providing care to trauma patients, or researchers, who had carried out research in trauma care and health services evaluation. All participants had at least 5 years of work experience.

Each focus group discussion was administered by three persons: the coordinator, the scribe and the observer (1 Emergency Medicine Specialist and 2 Health services management experts). In the beginning of each session, the researchers were provided with adequate explanation about the objectives and method of focus group discussion. Also, all of the participants were assured that the information provided by them would be completely confidential. During the sessions, the questions were asked by the coordinator, transcribed by the scribe, and recorded by a voice recorder. In addition, the observer tried to consider all the participants and to further engage those who rarely contributed to the discussions.

## **Interview**

Totally, 16 interviews were used for data collection. Before each interview, an interview guideline was provided by literature review. Interview questions included:

1. What is your opinion about the importance of trauma care and trauma assessment indicators?
2. What are the indicators at the hospital level for the evaluation of trauma care?
3. What are the criteria for the assessment of trauma care in the three areas of structure, process and outcome?
4. What are the characteristics of the evaluation?
5. How to evaluate? When? By whom? How to use the results?
6. What are the barriers to evaluating and collecting information about indicators?
7. Does the assessment through the defined indicators affect the quality of the trauma care?
8. What are your suggestions for improving trauma care?

Selection of the experts was based on objective sampling, which was followed by snowball sampling [19] and continued until information saturation (the selection of participants was continued until new information was raised by them). The characteristics of the participants were the same as before (focus group discussion). Phone coordination was performed before each interview. Interviews were face-to-face and each interview lasted for 45 to 60 minutes. Before each interview, a datasheet, including a summary of the study objectives, the interviewer's information and interview date was sent to the participants. The location of interviews was selected in accordance with the interviewees' tendency and they were done in the participants' work place. All of the interviews were recorded by a voice recorder and were noted down by the interviewer.

## **Data analysis**

All the recorded data were transcribed word by word and then they were compared with the interviewer's notes during the interview. The texts were read again and again and then were encoded and categorized. Next, they were analyzed through content analysis. The procedure was as follows: Two members of the research team studied the transcription independently and put their comments and main codes in the margin of texts. Then, the research team discussed the main subjects during some meetings. At the end

of meetings, they reached a consensus about the study themes. Finally, the themes were categorized. Some themes were merged and some were written as separate themes. Next, all sub-themes were based on a logical and thematic relationship with each other in the main categories, which in fact were the main themes.

## **Validity and reliability of data**

To promote the accuracy and reliability of data, they were reviewed by the participants. In other words, a summary of the transcribed data was returned to the participants in order to let them approve data accuracy [20]. Then, their comments were applied. In addition, to achieve triangulation the data were coded and the themes were determined by the consensus of the research team [20].

## **Ethics**

An official invitation letter along with an informed consent form was sent by Faculty of Management and Medical Informatics to the participants of focus group discussions and interviews. Before recording participants' voice, their consent was obtained and the participants' code was used instead of their name. The participants voluntarily participated in the discussions. The main project was assessed by Ethics Committee of Tabriz University of Medical Sciences and was approved by reg. no.: IR.TBZNED.REC.1396.560.

## **Results**

### **Participant profile**

Majority of the participants were male (88.88%) with sufficient work experience (> 10 years). The age range of the participants was 30 to 60. Table 1 shows demographic information of the participants.

Table 1  
Demographic information of the participants

Variable		Number	Percent
Sex	Female	4	11.12
	Male	24	88.88
Age	30–40	6	21.43
	41–50	15	53.57
	51–60	7	25
Specialty	Emergency medicine	4	14.28
	Orthopedist	3	10.71
	Anesthesiologist	1	3.58
	General surgeon	2	7.14
	Neurosurgeon	2	7.14
	Internist	1	3.58
	General physician	4	14.28
	Nursing	6	21.43
	Epidemiologist	1	3.58
	Health services management	3	10.7
	Medical records expert	1	3.58
Work experience	5–10 years	5	17.86
	11–20 years	12	42.86
	21–30 years	11	39.28

The experts addressed four main topics including: trauma care importance, trauma care indicators, stages of trauma care evaluation, and trauma care promotion. Table 2 shows the main and sub themes of the study.

Table 2  
Main and subsidiary themes

Item	Main themes	Sub themes
1	Trauma care importance	The involved Individuals' being young and productive The effectiveness of trauma care
2	Trauma care indicators	Pre-hospital indicators In-hospital indicators Post-hospital indicators
3	Stages of trauma care evaluation	Evaluation prerequisites Finalization of indicators prior to evaluation Determining evaluation time scope Determining evaluation dimensions Monitoring and evaluation Use of evaluation results
4	Trauma care promotion	Balancing workload in trauma centers Enhancement of information system Considering extra-organizational dimensions in trauma care Empowerment of trauma care providers

## 1. Trauma care importance

According to the experts' perspective, owing to the significance of trauma care, function and evaluation of trauma care performance can be considered from two perspectives:

### ***A. The involved Individuals' being young and productive***

Most traumatic accidents, such as car accidents and occupational accidents, show an increasing trend across the world. Most of the trauma-affected people are young. Indeed, they are at production and activity age. Trauma results in the death or disability of these young people. They may lose their life due to the lack of adequate information or no timely and appropriate interventions in the accident scene or in emergency centers. The secondary disabilities will be very costly as well. They actually will need expensive rehabilitation services in order to return to their normal life.

### ***B. Effectiveness of trauma care***

Experts believed that the interventions that can be considered as trauma care have been clearly defined. Trauma patients are patients with acceptable prognosis. This means that the more the patients are provided with care services, the higher the curing chance is. Providing timely cares improves therapy, makes it effective and decreases inpatient bed occupancy rate. Trauma patients are not chronic patients. Therefore, if their problems are managed accurately, they will be treated. On the other hand, most traumas are latent and need timely diagnosis and treatment because they may seriously damage other organs.

## **2. Trauma care indicators**

According to the experts' comments, indicators of different phases of trauma should be determined in order to identify and evaluate whether trauma care services are provided acceptably. Then, by comparing current procedures with relevant standards, judgments may be made on current trauma services. The experts have outlined the indicators of three areas: pre-hospital indicators, in-hospital indicators, and post-hospital indicators.

### ***A. Pre-hospital indicators***

Many interventions of pre-hospital phase are crucial and vital. Generally, at accident scenes and during the transportation of patients to hospital, there is little information about the status of patients, especially in developing countries where there is a weak documentation system. On the other hand, patients' status at this stage can affect their next condition in hospital. The experts argued that there are always questions about the quality of services. The first questions are as follow: when did they contact the medical center? By what means was the patient taken to hospital? How long did it take to take the patient to hospital? How was the injured patient removed from the accident scene? How and when was the patient immobilized? When was serum and drug therapy initiated? How was the ambulance operator knowledge? What was the equipment of the ambulance?

Generally, all guidelines and instructions including the instructions concerning immobilization, bleeding control, and safe air ways, should be followed correctly. The adequacy of explanations provided by the technician in charge is of high importance in the continuity of care services. The experts believed that all mentioned items should be considered through the definition of appropriate indicators. Such indicators highlight the importance of the completeness of assessing and- stabilization of patients in pre hospital phase.

### ***B. In-hospital indicators***

The specialists held that care service indicators should be derived from clinical guidelines. Clinical guidelines are algorithms used to initiate patient evaluation, administer treatment, complete treatment process, define care key points, evaluate treatment trend, and measure the patient's recovery rate. The specialists asserted that all principles of care service can be defined as an indicator.

The experts asserted providing timely and accurate medical and nursing services are considered as the determinants of these operations. At the arrival, patients are triaged considering injury degree. It is



essential that considering their damage level, the patients be triaged and prioritized accurately. The interval between the entrance of patient to hospital and doctor's visit is of high importance because patients are treated in accordance with the doctor's decisions. Active trauma team and their timely presence beside patients facilitate and accelerate such decisions. Accurate decision making decreases hospitalization period and, as a result, cuts hospital costs.

The experts believed that the time required to transport patients to Para clinical wards, including radiology and computed tomography scan wards, is very important and determines the ultimate time required for patient deposition. Waiting time between patient's depositions to hospitalization or transportation time, taking patient to surgery room, or waiting times in the main surgery room are of high important.

According to the experts' viewpoint, timing indicators are beneficial and can be calculated. These indicators were first determined by an expert panel. Later, they were determined based on clinical evidence. During in-hospital period, patients have the highest prognosis level. These times cannot be accurately extracted from patients' documents. However, online systems eliminate this problem. In such systems, any person involved in patients' care services and evaluation process registers their start-end service time in the system.

GCS (Glasgow Coma Scale) is another important indicator, according to the specialist's comments. GCS is a scale used to determine depth and intensity of the decreased levels of consciousness in people aged >5. This indicator is typically used in brain damages, or other consciousness-disturbing factors, and determines the type of cares to be provided. The fall of GCS after transporting the patient to clinical centers, or after a couple of days from accident, is considered as an important outcome indicator and the relevant cause shall be certainly assessed.

Based on the experts' views, calculating injury severity using some scales such as ISS (Injury Severity Score), GAP (Glasgow Coma Scale, Age, and Systolic Blood Pressure score), RTS (Revised Trauma Score) and TRISS (Trauma and injury severity score) , and calculating survival probability by adjusting injury severity score are among factors demonstrating the quality of services provided to trauma patients. The indicators are being used across the world. On the other hand, mortality itself is among the simplest outcome indicators. However, the quality of services cannot be judged according to this indicator alone because it is influenced by many other factors including visit time, duration of assessment, and service processes. Mortality and morbidity indicators are routinely collected. Although they are easily collected, they rarely are compared with real facts. Correct processes lead to appropriate consequences.

The experts held that input is always the first-rank priority and to provide appropriate services minimal degrees should be determined. For instance, determining the number of service centers and the time required to access them is vital. The adequacy of service centers affect access time. Moreover, the adequacy of human resource and physical space are important in facilitating care services. Some hospitals are old and suffer inappropriate design and cannot admit and treat trauma patients in a large

scale. Inappropriate appearance and malfunctioning equipment create a stressful environment for patients, their family, and personnel.

The specialists argued that some indicators might be important at national level where they are collected throughout the country (Iran). Therefore, adopting these indicators in trauma cares may be beneficial. One of these indicators of outcome is the frequency of unwilling injury occurrence, or central event, which is an important consequence indicator. This indicator is collected for trauma patients who are injured within the first 24 hours and, then, are assessed in mortality committee in order to find the cause of accident and to prevent its re-occurrence. The other indicator that The Ministry of Health and Medical Education insists on collecting it is successful CPR of trauma patient's indicator, which is collected separately. Also, occurrence of hospital infections is collected for all patients and can be provided separately for trauma patients. According to the experts' view, air way, bedsores and post-surgery cares, and creating appropriate feeding ways are of important factors that should be assessed and performed correctly after hospitalization too.

### ***C. Post-hospital indicators***

The experts opined that many patients become disabled due to trauma and they should be continuously checked by physiotherapists and at times be referred to rehabilitation centers. Assessing the individual's quality of life, returning him/his to previous normal life and obtaining acceptable functioning status are other dimensions of such assessments. In the simplest case, in-clinic checkups and the rate of re-reference of patients to hospitals show the extent of curing. GOS (Glasgow Outcome Score) is another important indicator demonstrating the functional status of patients after being discharged from hospital.

Following trauma, a patient may suffer from mental problems, even depression, besides physical problems. Services provided by social workers, referring to patients' home and even the assistance of volunteer people could assist patients and prevent further damages and costs.

## **3. Stages of trauma care evaluation**

After they pointed to the indicators, the experts claimed that after the above mentioned indicators are determined, it is possible to measure trauma care services in accordance with defined stages. These stages included: evaluation prerequisites, finalization of indicators prior to evaluation, determining evaluation time scope, determining evaluation dimensions, monitoring and evaluation and use of evaluation results.

### ***A. Evaluation prerequisites***

All evaluations need a qualified leader. In addition, prior to evaluations, all service providers should be informed of the evaluation procedure and learn how to use the obtained results and yield to its results. The issue that the experts pointed to was that trauma care evaluations should be made in accordance with the level of facilities and the nature of activities.

The specialists believed that data are the key elements of evaluations. Selecting a certain person for collecting raw data for evaluation is of high importance. On the other hand, the higher the reliance on online and computer-aided systems, the lower is the likelihood of human error. Indeed, using in-system data assists the evaluation process provided that they are registered accurately.

### ***B. Finalizing indicators prior to evaluation***

In order for the indicators to be used, they should be primarily assessed. Indeed, the indicators, themselves, need to be monitored. This monitoring includes investigating if the indicators can be used and are necessary at different time periods. The revision of indicators prevents time waste, human resource and money waste. Hence, certainly in the following evaluations different indicators will be available.

According to the experts' view, prior to initialization of evaluation process, consensus should be achieved as to the studied indicators. The indicators should be evidence-based and should be in connection with outcomes.

### ***C. Evaluation time scope***

The specialists argued that the more an indicator is related to mortality, they should be studied within shorter intervals. Indeed, indicators should be prioritized. The first priority belongs to the indicators that have a direct relationship with death. Depending on indicators, evaluations may be practiced on a daily, weekly, monthly or annual basis. Therefore, consensus should be achieved about evaluation time scope prior to initializing evaluation.

### ***D. Dimensions of evaluation***

The experts believed that evaluations should have broad dimensions and any given problem should be studied from different angles. Indicators may be defined at the first step and, then, comparisons may be made with ideal values. Assessment of awareness, knowledge, attitude and skill of service providers is another step of evaluation. This issue aids to realize whether staffs know how to perform their tasks and how they should perform them ideally. The assessment and use of service receivers' opinion is important too. Therefore, it should certainly be evaluated in the framework of patient's satisfaction measurement.

### ***E. Monitoring and evaluation***

The experts asserted that external evaluations are generally performed by auditor organizations, such as accreditation organizations, and this may be very beneficial. Principally, it is better to select out-organization auditors because they are not a stakeholder of the studied system. In addition, cares should be monitored during therapy process. For on-job evaluations, it is better to use in-organization employees, who are familiar with the processes of the provided services but do not individually benefit from the procedure.

According to the experts' comments, modern trauma care monitoring techniques are currently being used. For example, the interventions on trauma patients are recorded by cameras and then, judgments are made concerning the accuracy and adequacy of the interventions.

#### ***F. Use of evaluation results***

Experts believe that establishing a relationship between evaluation results and disease outcome leads to the primary, secondary and tertiary preventions and reduces trauma-induced effects. It is better to investigate evaluation results within hospital committees in order to follow up relevant feedbacks through relevant clinical groups. Then, they should be submitted to relevant authorities. Eventually, both positive and negative results along with promotion outcomes should be made public through media. It is probable that out-hospital and out-clinical causes are identified after evaluations.

### **4. Improvement of trauma care**

The experts believed that in addition to the assessment and elimination of weaknesses and drawbacks, extra-organizational dimensions and the provision of necessary facilities and information should be taken into account in order to enable the improvement of trauma care. Problems should be reported just as they occur. Managers tend to refuse many problems and to show positive dimensions, instead. If the culture of finding the faulty person is put aside and the concepts of improvement and promotion are put ahead, this will be beneficial to the whole health system. Experts said some intervention improve trauma care. These interventions were balancing workload in trauma centers, enhancement of information system, considering extra-organizational dimensions in trauma care and empowerment of trauma care providers.

#### ***A. Balancing workload of trauma centers***

The experts declared that although the shortage of trauma care centers is a challenge in providing trauma care services, the most important problem in Iran is the lack of binding to referring system which, in turn, leads to increased workload and inappropriate services. Some trauma centers may be overloaded where some patients may not need the services of these centers. Conversely, some centers may experience no reference, and consequently, face inefficiency problem.

#### ***B. Enhancement of information systems***

Experts insisted that improvement of trauma cares requires improvement of information system. Data are the improvement resources of any system. The incorrect attitude towards data collection is that it is a time-consuming and in vain process. However, if the benefits of utilizing data are explained properly, this will facilitate the process of collecting data about indicators, and consequently will promote the quality.

The specialists stated that, unfortunately, trauma registry system has not been defined in Iran. Building a trauma registry system can aid the improvement of trauma cares. If all data of trauma patients are fed

into the system and then analyzed, in addition to helping make judgments on the quality of services, they will assist doctors to make proper decisions in future.

### ***C. Extra-organizational dimensions in trauma cares***

According to the experts' views, trauma care improvement depends on the reduction of faults and human errors. On the other hand, it at times turns into a social and extra-organizational problem. Trauma indicators are broad social indicators where even an education-oriented behavior may affect trauma incidence. It needs to develop people information and cooperation of many organizations in society. This is a conventional problem of the 3rd world countries.

### ***D. Empowerment of trauma care providers***

The promotion of trauma cares needs fully specialized staff in medicine and nursing sectors. Providing therapies and cares in accordance with relevant protocols, and educating employees based on such protocols will always improve trauma cares. Particular trainings are necessary for trauma care providers and, in turn, improve such cares. Experts argued that wherever the subject of education is introduced, it results in changes.

The experts were sure that consistency of evaluations is a success factor by itself and it converts decisions to actions. Monitoring improves performance almost by 20%. There is a proper infrastructure due to the availability of some programs such as quality improvement, clinical governance and evaluation departments, the development of which enhances individuals' knowledge on the issues of quality and patients' safety.

## **Discussion**

This study showed that the experts acknowledged the importance of trauma cares and believed that trauma care performance needs to be studied and evaluated. The indicators of different phases, including pre-hospital, in-hospital and post-hospital, should be defined in order to carry out evaluation. Evaluations are to be practiced based on given principles and using beneficial indicators so that evaluation results may be used in the promotion and improvement of trauma care services. According to the experts' viewpoints, modification of referral system, training, enhancement of information system and considering extra-organizational issues can aid the promotion of trauma care services.

The experts believed those traumas patients are young and generally are at activity and working age. Hence, their health status will be endangered if they do not receive appropriate cares. Sometimes, the best treatment is not provided to patients. According to studies, medical errors are prevalent in trauma patients while 2.5–14% of such errors are preventable [6]. For example, according to the study of Ahmadinejad et al. on trauma patients admitted to ICU (Intensive care unit), 22.9% of discharged patients and 24.3% of dead patients showed at least a positive bacterial culture during hospitalization period [20].

From the perspective of the participants in the present study, a number of indicators should be defined. Performance indicators serve as instruments for process and outcome assessment within health service providing system. They are essential components of performance improvement [21]. Many trauma care specialists advocated the definition of some indicators for trauma care evaluation. The purpose of defining indicators for trauma cares is to compare actual trauma care levels with ideal ones and to identify patients who need more cares, but receive under-standard cares [12]. There is no consensus on the indicators employed. Nevertheless, the use of indicators is common in trauma centers [22].

The experts said appropriate therapy in pre-hospital field is very important. Patients' life is significantly influenced by the quality of services provided to them during this transportation. According to Dick's study, patients' survival chain begins from the occurrence of an accident and continues to transporting them to a defined trauma center or a hospital [23]. In a study, Zafarghandi and Moeini evaluated how injured cases are transported to a trauma center in Tehran. They argued that building a venous way and immobilization interventions was done prior to transporting patients to the hospital in 17.5% and 6.5% of cases, respectively; while, no sufficient attention was paid to their air ways. Transportation time starting from the occurrence of accident was 3 hours [24].

Based on the experts' perspective, health care services should be provided in accordance with clinical protocols. Therefore, it is better that the designed indicators be founded on clinical protocols. The results of Shakford et al. study in Sent Diego state showed that 7.6% of in-hospital mortalities in non-trauma facilities and 2% of them in trauma center could have been prevented. Wrong diagnosis in trauma hospital and technical errors, side effects and protocol violation in non-trauma hospitals were the causes of preventable deaths [25].

According to the expert's viewpoint, patients' disposition is one of the most important problems and delay in this case will induce negative effects on patients. Wills et al. conducted a study on 5104 blunt trauma cases with a severity score > 15. Their results indicated that three indicators were accompanied by the rise of mortality rate. These indicators were abdominal surgery after 24 hours of patients' entrance to hospital, treatment of blunt compound tibial after 8 hours of entrance, and no-immobilization of femoral diaphyseal fracture. In addition, three indicators were accompanied by prolonged hospitalization of the patients in wards and ICUs (Intensive care unit). These indicators were abdominal or cranial surgery after 24 hours of entrance, patients with deep vein thrombosis (DVT) or pulmonary embolism and patients with bed sore [26].

The experts believed that trauma-patients mortality is one of the indicators is routinely extracted. However, service process indicators are more important because they are in fact the processes that ultimately lead to mortality. Skaga et al. studied 3332 patients in a university hospital in Norway and evaluated mortality rate in three periods: before discharging from hospital, before discharging from somatic care and within 30 days after injury. According to their results, 81.7% of mortalities occurred in the first period, 98.8% occurred before somatic care, and 95.4% occurred within 30 days after injury [27].

The specialists believed that calculating injury severity and survival likelihood indicators that are used to investigate and compare trauma centers. Studies suggest that although mortality is a simple indicator, preventable mortality is more beneficial indicator, and which provides more improvement in trauma care services [28]. Noroozi et al. studied 1000 trauma cases admitted to Fatemi Hospital in Ardebil. Following the calculation of TRISS, survival chance of each patient was calculated. According to TRISS index, 91.5% of trauma patients should have survived while only 90.3% survived in practice [29]. Mousazadeh et al. reported mortality in the two traffic injuries groups with high and medium risk was 25.63% and in the low risk group was 0.42. The mortality risk was predicted for both severe and moderate risk (more than 50%) and low risk (less than 5%) [30].

The specialists held that there should be some indicators for post-discharge phase in order to evaluate the functional status of patients suffering disability. A considerable portion of severe trauma patients suffer long-term disabilities. According to studies, the functional status of these patients is below the normal level of society within 1 year after injury [31]. Studies suggest that patients rarely reach a stabilized situation at discharging phase and hence they need to be re-visited. There are some measures to evaluate the post-discharge functional status of patients. GOS, for example, concentrates on functional and participation levels such as participating in social affairs, transmission, returning to work, making communications and participating in welfare activities [28].

The specialist stated that trauma care services need some infrastructures, including physical space and facilities. The study of Mock et al. evaluated WHO guidelines for the minimum facilities required from trauma cares in Mexico, Vietnam, Ghana and India. They evaluated 100 rural and urban sites and concluded that required equipment is almost adequate in these countries. However, there were some gaps too, especially regarding the shortage of airway-related equipment, chest tubes and trauma drugs and long waiting time for receiving some equipment such as radiography and laparotomy [32].

The experts held that data are the key element of evaluation and they need to be accurately recorded. Further, the availability of computer-based and online data record systems decreases human errors. Also, programs for improving trauma care quality emphasize data accuracy. According to Nogard et al. study, Using several mechanisms assures data quality in these programs in the U.S. and Canada. The mechanisms include organizing training courses for data registers, monthly training activities, including conferences and quizzes, logical data check programs, evaluation of output values and internal and external evaluations of data registry [6].

The experts asserted that the employed indicators themselves need to be monitored and evaluated. Santa et al. suggested the necessity of re-evaluation of indicators. These authors argued that indicators are compatible with the knowledge available at study time and they need to be upgraded periodically. According to guidelines, the best upgrading time is at least once every 5 years. On the other hand, they suggested that experts' opinion alone is not sufficient for developing indicators. Such indicators indemnity performance guarantee should be evaluated; otherwise, it is likely that some irrelevant or non-executable indicators may be developed. According to studies, indicators should be developed around the

axis of patients and impacts and should be compatible with local environments and, actually, with the level of activities [11].

The specialist believed that any evaluation should study from different points of view. In other words, an evaluation should be comprehensive. A study was conducted with the cooperation of Iran Ministry of Health and Medical Education to establish performance management system in the emergency center of Ziaeiian hospital. The study defined 52 indicators and variables and classified them into three classes namely: patient's satisfaction, time and quality of activities, and financial and human indicators, which were collected routinely. The project considered 6 group indicators including: patient's satisfaction, human resource empowerment (motivation, training and attracting qualified employees), development of emergency center-related sub-indicators (equipment, information), emergency center expenditures and quality of services [33].

The experts asserted that the evaluation is performed at the end and during service delivery (monitoring). According to studies, external evaluation affects health care services. Governments, experts, managers and insurance organizations have to determine new plans for public accountability, transparency of quality improvement and value creation [34]. Self-assessments and the assessment of service providers concerning the quality of their services is a principle used by JCAH (Joint Commission on Accreditation of Healthcare Organizations). In fact, it provides the opportunity of being aware of performance [35].

The experts emphasized that building a trauma registry system will be beneficial in the improvement of trauma care services. A trauma registry system collects and preserves the variables associated with processes and outputs. A trauma registry is basis for performance improvement program and provides resource data to be used to audit the quality of a trauma system. The study of Standrard et al. argued that a registry system includes the data of all trauma care stages, from pre-hospital phase to rehabilitation and post-death experiments, if legally required [21].

The experts also pronounced that disobedience to referral system and lack of trained employees, who are able to provide services to patients with multiple injuries, make it difficult to provide suitable services. For example, Albania lacks adequate and defined trauma hospitals. This issue causes patients not to be directed to hospitals with qualified services. On the other hand, there are only few trained employees for trauma care services and this country needs advanced education system for trauma surgeries, emergency medicine techniques or life support programs for trauma patients [4]. Chiria et al. in their study suggested that surgeons should contribute to the diagnosis, resuscitation and management of at least 50 patients annually in order to be able to acquire emergency care standards certificate. Moreover, all physicians, nurses and technicians should be trained with a multi-disciplinary approach in order to provide suitable services to patients with multiple injuries [36].

Sometimes, it is necessary to consider other problems rather than just in-hospital issues in trauma care improvement. There are other factors that contribute to the increase in the rate of mortality and negative impacts on patients. These factors may include unsafe roads, concentration of population in high-risk



areas with no hospital, and events associated with war, fire, landslide, natural disasters, accidents, lack of rules and laws and incorrect execution of rules [37].

## Conclusion

Trauma patients are among those who need immediate cares and therapies. However, they do not always receive the best possible cares. Performance evaluations, and relevant feedbacks, assist health teams and managers to understand under-standard performance and, hence, reduce mortalities. The availability of proper, valid, reliable and outcome-relevant indicators is necessary for performance evaluation. In order to improve performance, in addition to relying on evaluation results, it is necessary to provide equipment, physical space, trained personnel and information system, and data registry system. Moreover, trauma care is an extra-organizational problem and requires vast resources and experiences, as well as local, regional and national commitment, and participation of all relevant organizations.

## Abbreviations

**AIDS:** Acquired immune deficiency syndrome; **CPR:** Cardio Pulmonary Resuscitation; **DALY:** Disability adjusted life years; **DVT:** Deep Vein Thrombosis; **GAP:** Glasgow Coma Scale, Age, and Systolic Blood Pressure score; **GCS:** Glasgow Coma Scale; **GDP:** Gross Domestic Product; **GOS:** Glasgow Outcome Score; **ICU:** Intensive care unit; **ISS:** Injury Severity Score; **JCAH:** Joint Commission on Accreditation of Healthcare Organizations; **RTS:** Revised Trauma Score; **TRISS:** Trauma and injury severity score; **U.S:** United States; **WHO:** World Health Organization

## Declarations

### Ethics approval and consent to participate

This study was derived from a PhD. thesis. The main protocol of the research was reviewed at the Ethics Committee of the Research Deputy of Tabriz University of Medical Sciences and was approved by the code of IR.TBZMED.REC.1396.560. All people participated in the research with their consent. All the participants in interviews and focus group discussions completed the informed consent form.

### Consent for publication

Written informed consent for publication of experts' perspectives was obtained from them.

### Competing interests

Authors declare that they have no competing interests.

### Acknowledgments

This study is a part of PhD thesis. The authors thank of Research deputy of the Tabriz University of Medical Sciences, Tabriz, and Islamic Republic of Iran for the financial support provided and all experts for cooperation in the study.

### **Availability of data and materials**

Not applicable.

### **Funding**

Financer was Research deputy of the Tabriz University of Medical Sciences.

### **Authors' contributions**

AJ and HS designed, and coordinated the study. YM wrote the initial draft of the manuscript. AJ, HS, MP, and YM contributed to the collection and interpretation of information and aided in the preparation of the manuscript. All authors have read and approved the final manuscript.

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